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DEPARTMENT OF THE ARMY
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SPREAD OF RICE BLAST DISEASE IN 1961 (IN FRANCE)

Extrait du Bulletin d'Information des Riziculteurs de France (Reprint from the Information Bulletin of the French Rice Growers) No. 80, 1961, pages 33-35.

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In 1961, climatic conditions were entirely different from those of the preceding years (1). The warm and dry summer impeded the spread of rice blast disease. It occurred in many places, but only in the form of strictly localized foci.

We studied two important outbreaks: one in a nursery, the other in a harvest crop. The preceding years, 1959 and 1960, were characterized not only by strong attacks by the mold, favored by meteorological conditions of high humidity and below normal temperatures, but also by faulty cultural practices (excessive use of nitrogen fertilizer).

In 1961, rice-growers directed their attention to the rate of nitrogen fertilizers applied. In general, the rate of application was more reasonable, especially because of some vegetative accidents which occurred unexpectedly in 1960. The most typical of these accidents was the retarded flowering of late rice varieties and, as a consequence, a lack of flowers because of a lack of warmth.

Meteorological Conditions

In Table 1 there are shown typical data of the periods during which the rice was attacked by the mold *Piricularia*. I have reported the air temperatures (maximum and minimum), hygrometry, winds and rainfall, especially rain falling in the area of St. Simon. The data were obtained through

(1) see Bull. Inf. Rizic. No. 63, 1959, No. 75, 1961

the courtesy of the Faculty of Agriculture at Arles and the Agricultural Services of Bouches-du-Rhone (2) [Rhone Delta].

An examination of the table reveals a period between June 3 and September 30, which was characterized by lack of rain and elevated temperatures at the same time. These factors inhibited the spread of rice blast disease. On the contrary, they favored the growth of rice plants.

Hygrometry

Charts of Table 1 show maximum and minimum values. They do not indicate the duration of each value, especially the duration of maxima. These maximum values are very often equivalent to 100. During periods of precipitation, the minima often remain elevated, i.e. above 80% relative humidity.

During the dry periods mentioned already earlier, the minima of the relative humidity were sufficiently low for inhibiting the spread of rice blast disease.

Wind

The main cause of drought in the summer is the mistral or northwind. This wind quickly dries out the atmosphere. It blows often, immediately following a rain and, as a consequence, reduces the effect of the rain. This explains why especially in the month of May many rains fell in sufficient amounts, but were not followed by plant epidemics.

Successive Attacks of Rice Blast

Piricularia requires a relative humidity above 90% in order to grow. If the humidity remains sufficiently low during the year, a spectacular epidemic will not develop. However, two important outbreaks were observed. These outbreaks were not confined to nurseries. At the time of planting out many seedlings had on their leaves typical necrotic lesions of rice blast disease. The mold caused a certain devastation, but without any great repercussions. In general, those leaves which had lesions were dead, drowned or floating about, because of the outbreak which had occurred during the transplanting step. The location at the surface of the water constituted a focus of infection, but the climatic conditions did not permit a spreading of the disease.

We have grouped in Table 2 the meteorological conditions which accompanied rainfalls. It may be seen that rain is not the only factor responsible for plant infections, but it is an indispensible element. Furthermore, humidity has to remain high for a sufficiently long period to enable old lesions to produce new spores which then infect new plant parts.

(2) We thank Mr. Clave, chief engineer, director of Agricultural Services, Bouches-du-Rhone; also, Mr. Bompard, engineer, Agricultural Services, Arles, who graciously supplied me with data gathered by them.

April 21 was a good example. There occurred an important rainfall of 33.7 mm with a heavy cover of clouds and a relative humidity of over 88% for a 24-hour period, which permitted sporulation and infection.

On July 12, on the contrary, rainfall was apparently sufficient and was followed by sunshine and mistral, but the relative humidity did not reach 90% and was, therefore, insufficient for spreading the infection.

In general, there occurred several rainy periods which were sufficiently widely separated by warm and dry periods which prevented the spread of the disease. In fact, formation of conidia is always abundant on freshly-formed lesions before necrosis develops. On the contrary, when the necrosis of infected spots is in an advanced stage, the number of conidia is much reduced. It is the spacing of the rainfalls and highly humid periods which permit the development of necrosis and, as a consequence, sporulation and infection.

The conditions of the year merely confirmed the well-known requirement of *Piricularia* for high relative humidity, because this year, with its droughts, did not permit strong attacks of rice blast disease. The two outbreaks observed corresponded to two distinctive rainy periods.

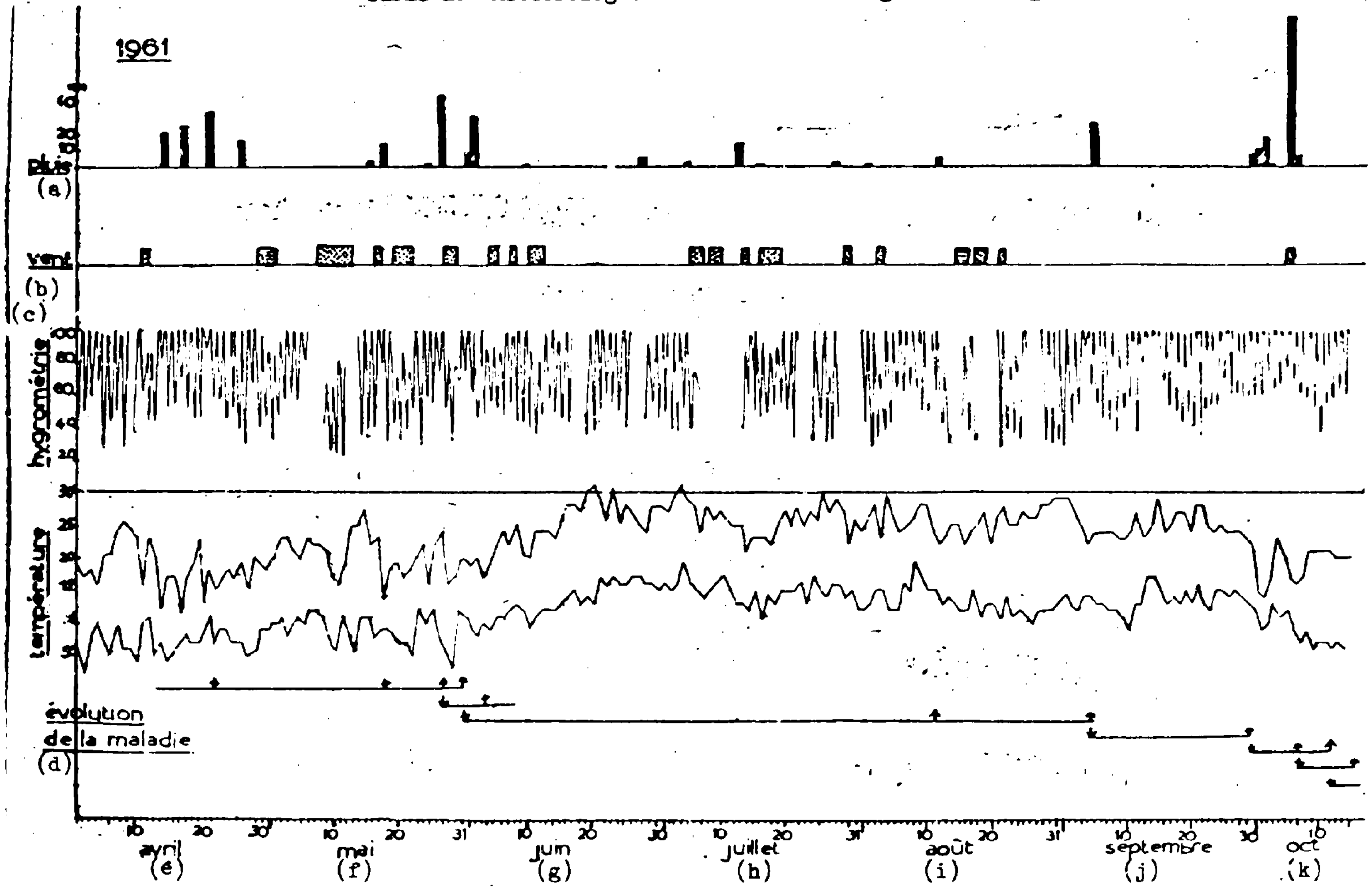
Behavior of Varieties

Most rice varieties were susceptible to rice blast. In one nursery, all plants were destroyed during an attack. For reasons already stated above, the disease did not spread out. At the end of the growing season, both late and early varieties were harvested late. All of them had been attacked by rice blast disease, but without any consequences for the harvest, because of the growth phase in which the plants were attacked. The last infection of the season merely created a means of transmitting a seed infection into 1962. Likewise, at the start of October, we observed an attack by *Piricularia* on the variety "Cesariot", which had been left in the field for seed formation.

The variety "Balilla" was also attacked, but only after the formation of kernels. Such an infection has but small consequences.

In conclusion, this year has been sufficiently normal (with a dry and warm summer). Apparently, the early varieties harvested when ripe escaped attacks. Their respective resistance against rice blast disease has been discussed.

Table 1. Meteorological Conditions During the Growing Period of Rice



[Key on following page]

Key to Table 1. [on preceding page]

(a) rainfall
(b) wind
(c) hygrometry
(d) spread of rice blast
(e) April
(f) May
(g) June
(h) July
(i) August
(j) September
(k) October

Key to Table 2. [on following page]

(a) rainfall
(b) sky
(c) Wind N= north
(d) hygrometry
(e) temperature °C minimum - maximum
(f)
(g) April
(h) May
(i) June
(j) July
(k) August
(l) September
(m) October
(n) cloudy
(o) sunny
(p) hazy
(q) no report
(r) neither sporulation nor infection
(s) sporulation and infection
(t) no sporulation
(u) sporulation in sheltered locations, no infection: dry atmosphere
(v) sporulation and infection in sheltered locations
(w) sporulation
(x) infection
(y) sporulation: without infection

Table 2. Meteorological conditions which accompanied different rainfalls and the consequences for the spread of rice blast

Date	Pluie mm. (a)	(b) Temps	Vent N = Nord (c)	Hygrométrie (d)	Température min. — max.	(f) Evolution du champignon
(g) 14 avril	21	(n) couvert	—	82 — 100	7° — 13°	(r) ni sporulation, ni contamination
(g) 17 avril	25,2	(o) soleil	—	70 — 100	7° — 12°	(r) ni sporulation, ni contamination
(g) 21 avril	33,7	(n) couvert	—	88 — 100	11° — 13°	(s) sporulation et contamination
(g) 26 avril	17,5	(o) soleil	N	39 — 100	7° — 17°	(t) pas de sporulation
16 mai	3,6	(p) nuageux	N	36 — 100	11° — 22°	sporulation dans les stations abritées, (u) mais pas de contamination dessèchement de l'atmosphère.
17 mai (h)	0	soleil (o)	N	39 — 100	11° — 23°	
18 mai	15,9	nuageux (p)	—	78 — 100	8° — 14°	
25 mai	0,8	couvert (n)	—	58 — 99	12° — 16°	(v) sporulation et contamination dans les stations abritées
26 mai (h)	0	nuageux (p)	—	45 — 100	10° — 22°	
27 mai	44,5	couvert (n)	—	73 — 100	12° — 24°	
28 mai	0	nuageux (p)	N	51 — 81	8° — 16°	
30 mai (h)	0	couvert (n)	—	67 — 100	3° — 17°	(w) — sporulation (x) — contamination
31 mai	9,6	couvert (n)	—	75 — 100	12° — 19°	
1er juin (i)	31,4	couvert (n)	—	62 — 100	9° — 19°	
27 juin (i)	5,2	soleil (o)	—	(sans) (q)	17° — 25°	(t) pas de sporulation
12 juillet (j)	14,5	soleil (o)	N	< 90	13° — 25°	(t) pas de sporulation
12 août (k)	7,7	couvert (n)	—	62 — 100	15° — 22°	([illegible]) sporulation ; sans contamination
4 sept. (l)	0	couvert (n)	—	89 — 100	14° — 22°	(w) — sporulation (x) — contamination
5 sept.	27,7	couvert (n)	—	65 — 100	14° — 24°	
30 sept. (l)	8,3	couvert (n)	—	57 — 100	13° — 22°	(s) sporulation et contamination
1er oct. (m)	11,4	couvert	—	69 — 100	12° — 15°	
2 oct.	18,4	couvert	—	69 — 100	9° — 14°	
3 oct.	1,2	nuageux (p)	—	72 — 100	[illegible] — 17°	
4 oct.	0	nuageux	—	62 — 100	13° — 23°	(s) sporulation et contamination
5 oct.	0	nuageux	—	66 — 100	11° — 21°	
6 oct.	92,2	couvert (n)	—	76 — 100	12° — 17°	
7 oct.	7,3	couvert	—	67 — 100	9° — 16°	(s) sporulation et contamination

Hygrometry provided daily maximum values which almost always are equivalent to 100. These values were obtained during the night. From the point of view of plant pathology, the importance is the duration of the maximum value and whether or not it allowed sporulation and infection to occur.

[Key to Table on predecing page]